

VIRTUAL HUMAN PERFORMANCE AND FIRE GROUND SURVIVAL

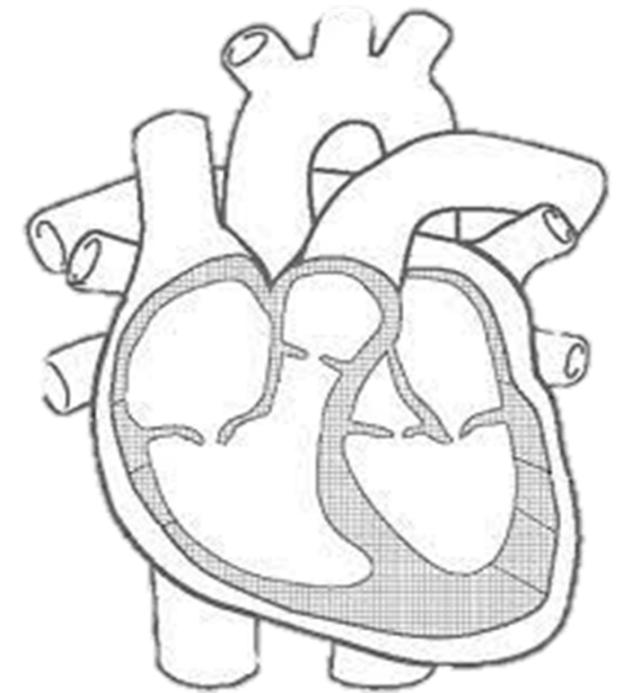
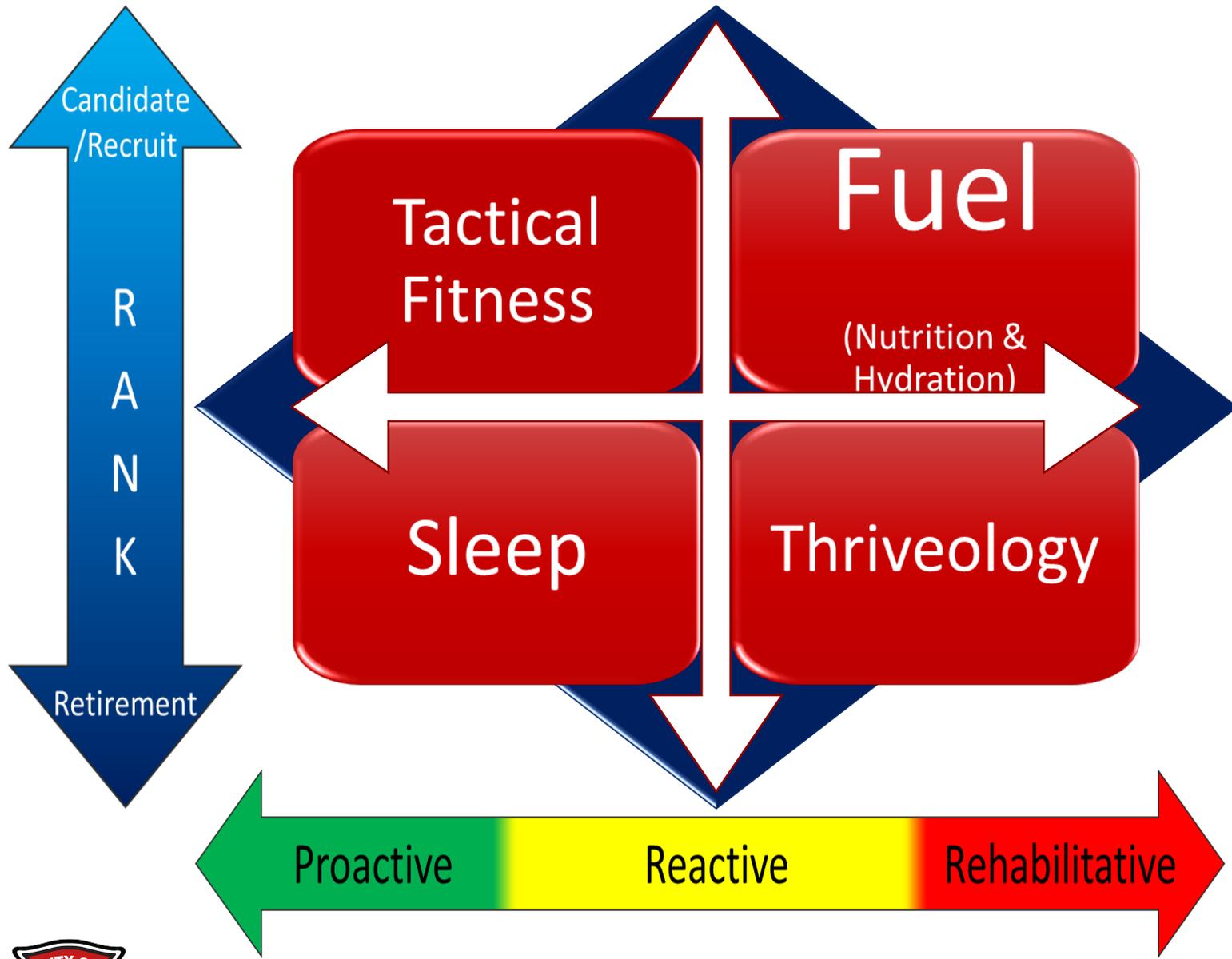
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TETRALOGY OF PERFORMANCE



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SFD PERFORMANCE INITIATIVE

Tactical Fitness

- Tactical Fitness Appreciation Day
- B-Strong – Blood Flow Restriction Training
- But How Fit is Fit Enough?

Fuel

- Hydration Protocols – best guess??
- Nutrition Guidance specific to the demand
 - Recruit training vs. Station Meals

Sleep

- Beyond Education
- Situation specific challenges (Recruits)
 - Barriers to quality sleep.

Thriveology

Beyond Resilience
Mental performance
And so much more

Seattle
F.I.R.E
T.H.R.I.V.E.S

F_{ailure} = Opportunity
I_{ntentional}
R_{elentless}
E_{quanimity}
T_{houghts}
H_{health}
R_{elations}
I_{ntellect}
V_{isualize}
E_{xpiration}
S_{piritual}



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OPPORTUNITIES..

#1 Question: How fit is fit enough?

Candidate: If I can squat two times my body weight; is that a sufficient goal?

Let's evaluate this question with a theoretical concept of "capacity"



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1ST – WHAT IS THE DEMAND?

Caveat: Population
(dept) Specific

Seattle Recruit Training Demand:

- 2 bouts of 3 hours of work under load.
- 3-4 days a week

Cardio vs. Strength:

- Both are equally important, but without stamina (fatigue resistance) neither one will matter.

Capacity vs. Demand

Can this be quantified?



Fitness considered equal, will anthropometrics influence capacity?



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Theoretical Capacity Reserve (TCR)

TCR is what's left in the "tank" for performing a skill/drill.

TCR= Total Capacity – consumption required to move mass

$$\text{TCR} = 100 - [(\text{Gear} + \text{Equipment})/\text{BW}]$$

	Recruit A	Recruit B
Body weight	200 lbs	150 lbs
Deadlift 2X BW	400 lbs	300 lbs
Full PPE + Hose Bundles	135.6 lbs + BW = 335.6 lbs	135.6 lbs + BW = 285.6 lbs
Theoretical Capacity Reserve		



Testing Evolution
(Powered by TCR)



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TCR continued...

Mechanical Advantage/ Disadvantage of Anthropometrics?

	Recruit A	Recruit B
Body weight	200 lbs	150 lbs
Deadlift 2X BW	400 lbs	300 lbs
Full PPE + Hose Bundles	135.6 + BW = 335.6 lbs	135.6 + BW = 285.6 lbs
Theoretical Capacity Reserve	33%	10%
Height - 1	6' 0"	5' 7"
Height - 2	5' 7"	6' 2"



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OPPORTUNITIES...

#1 Question: How fit is fit enough?

Candidate: If I can squat two times my body weight; is that a sufficient goal?

Let's evaluate this question with a theoretical concept of "capacity"

#2 Question: How can we reduce injuries?

Before we can mitigate injuries, we must understand them.

All too often, "antidotal data" and extrinsic solutions drive mitigation strategies.



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STEPPING OFF APPARATUS



Assumptions:

- 3 points of contact is the answer
- Hands are always free
- Always facing the rig

Potential Covariates:

- Leaving rig with SCBA
- Step length and width are optimal
- Landing mechanics are optimal
- Adequate lighting



HOSE MANAGEMENT INJURIES



Assumptions:

- Adequate Mobility
- Proactive injury mitigation is not necessary.

Potential Covariates:

- Limited IR Rotation (very common)
- Poor Hip Flexion Strength



Fire Service and Virtual Human Performance

Improving Performance → Increasing Survival

- Science based hydration protocols
- Equipment and PPE
 - Design improvements
 - Effect on performance
- Quantification of occupational demands
- Informed training specificity
 - Capacity vs. Demand
- Explore anthropometric predictors of performance/injury
- Reducing the unsustainable rate and severity of injuries



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